Leuze electronic

the sensor people

ERS200
E-STOP Rope Switch

GB 2008/12 607330
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make technical changes

SAFE IMPLEMENTATION AND OPERATION

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1 About this document

1.1 Other applicable documents

The information on the ERS200 E-STOP Rope Switch is divided into two documents. Document "Application information" contains only the most important safety notices.

↳ For the safe implementation, testing and operation, download document "Safe implementation and operation of the ERS200" from http://www.leuze.com/ers200 or request it from service.schuetzen@leuze.de or tel. +49 8141 5350-111.

Table 1.1: Documents on the ERS200 E-STOP Rope Switch

Purpose and target group	Title	Source
Detailed information for all users	Safe implementation and operation	On the Internet, download from: http://www.leuze.com/ers200
Basic information for technicians and machine operators	Application information	Print document part no. 607248 included in the delivery contents of the product

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1.2 Used symbols and signal words

Table 1.2: Warning symbols and signal words

	Symbol for dangers
NOTICE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injury Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for severe injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers that will result in severe or fatal injury if the measures for danger avoidance are not followed.

Table 1.3: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbols for action steps Text passages with this symbol instruct you to perform actions.

2 Safety

Before using the E-STOP Rope Switch, a risk evaluation must be performed according to valid standards (e.g. EN ISO 12100-1, EN ISO 13849-1, EN ISO 14121). For mounting, operating and testing, document "Safe implementation and operation of the ERS200" as well as all applicable national and international standards, regulations, rules and directives must be observed (e.g. machinery directive, low-voltage directive, work-equipment directive, safety regulations, accident-prevention regulations, EN 954-1, EN ISO 13850-1, EN ISO 13849-1, EN 60204-1). Observe and print out relevant and supplied documents and distribute to the affected personnel.

↳ Before beginning work with an E-STOP command device, completely read and understand the documents applicable to the respective task.

The following standards apply for the risk evaluation at the protective device prior to using the E-STOP Rope Switch:

- EN ISO 14121, Safety of machinery, risk evaluation
- EN ISO 12100-1, Safety of machinery
- EN ISO 13849-1, Safety-related parts of control systems

The realizable category of the integration in control circuits according to EN ISO 13849-1 and EN 954-1 is dependent on the used contact block and wiring.

In particular, the following national and international legal regulations apply for the start-up, technical inspections and work with Safety Switch:

- Machinery directive 2006/42/EC
- Low voltage directive 2006/95/EC
- Use of work equipment directive 89/655 EEC
- Safety regulations
- Accident-prevention regulations and safety rules

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2.1 Proper use

WARNING

Serious accidents may result if an E-STOP command device is not used properly!

- Do not use as a replacement for other protective devices.
- Investigate the cause of each release of an E-STOP Rope Switch along the entire length of the rope.

An E-STOP Rope Switch is a **supplementary** protective measure for shutting down in the event of an emergency and must not be used as a replacement for other protective devices. To ensure proper personnel protection, it must be mounted, connected and started-up by trained personnel. It must not be tampered with, must be in perfect condition and must be inspected regularly.

The rules and regulations for protection and safety at work and the recognised safety-related rules and regulations must be observed. These include:

- EN ISO 13850-1, Emergency stop - Principles for design
- EN ISO 13849-1, Safety-related parts of control systems
- EN 60204-1, Electrical equipment of machines

ERS200 E-STOP Rope Switches are actuated via a rope. They must be connected so that the switching function is actuated by moving the rope in any direction and the dangerous state is stopped immediately.

Connection conditions:

- rope is easily accessible
- E-STOP is possible at any time while the machine is running
- dangerous state is ended immediately, taking into consideration the appropriate Stop category
- danger zone and occupied area along the entire length of the rope are visible from the E-STOP Rope Switch
- start commands that result in dangerous states are only possible if the Reset button is manually unlocked
- can be easily accessed by qualified personnel for testing and replacement

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Furthermore, the ERS200 E-STOP Rope Switch must **not** be used under the following conditions:

- rapidly changing ambient temperature (leads to condensation)
- in the event of strong physical shocks
- in explosive or easily flammable atmospheres
- the mounting locations for E-STOP Rope Switches, stud bolts and deflection rollers are sufficiently stable
- the safety of multiple persons is dependent on the function of this Safety Switch (e.g. nuclear power plants, trains, aircraft, motor vehicles, incinerators, medical devices)

Handling the E-STOP Rope Switch:

- Observe mounting conditions (see chapter 6 "Mounting").
- The maximum permissible rope length must not be exceeded.
- Observe the permissible environmental conditions for storage and operation (see chapter 14 "Technical data").
- Immediately replace damaged E-STOP Rope Switches according to these instructions.
- Use cable gland, insulation materials and connecting wires of the appropriate protection rating.
- Protect E-STOP Rope Switches from strong physical shocks and vibrations.
- Protect E-STOP Rope Switches from penetrating foreign bodies (e.g. shavings, sand and blasting agent).
- Before performing painting work, cover all moving parts, indicators and the name plate.
- Immediately clean any contamination from the E-STOP Rope Switch and deflection rollers that impacts the function according to these instructions.
- Use only suitable original accessories (see chapter 13 "Accessories").
- Make no structural changes to the E-STOP Rope Switch.

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2.2 Competent personnel

Prerequisites for competent personnel:

- suitable technical training
- knows the rules and regulations for occupational safety, safety at work and safety technology and can assess the safety of the machine
- knows the instructions for the E-STOP command device and the machine
- has been instructed by the responsible individuals on the mounting and operation of the machine and of the E-STOP command device

2.3 Responsibility for safety

Manufacturer and operator of the machine must ensure that the machine and implemented E-STOP Rope Switch function properly and that all affected persons are adequately informed and trained.

The type and content of all imparted information must not lead to unsafe actions by users.

The manufacturer of the machine is responsible for:

- safe machine construction
- safe implementation of the E-STOP command device
- imparting all relevant information to the operator
- adhering to all regulations and directives for the safe starting-up of the machine

The operator of the machine is responsible for:

- instructing the operating personnel
- maintaining the safe operation of the machine
- adhering to all regulations and directives for occupational safety and safety at work
- regular testing by competent personnel

2.4 Exemption of liability

Leuze electronic GmbH & Co. KG is not liable in the following cases:

- E-STOP Rope Switch is not used as intended
- safety notices are not adhered to
- mounting and electrical connection are not properly performed
- proper function is not tested (see chapter 9 "Testing")
- changes to E-STOP Rope Switch, rope or deflection rollers

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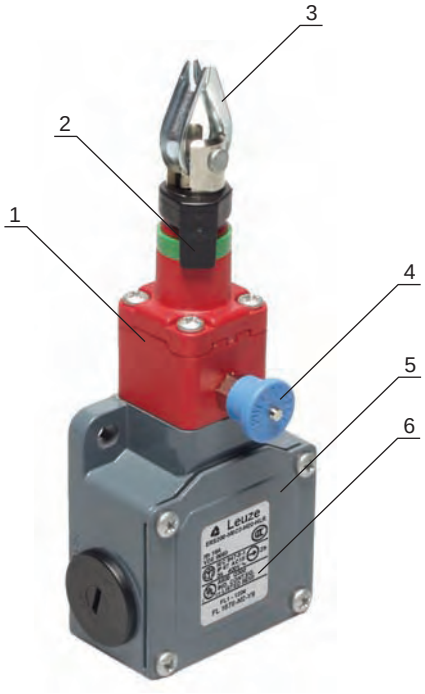
3 Device description

The E-STOP Rope Switch of the ERS200 series is an E-STOP command device in accordance with EN 60947-5 and satisfies protection rating IP 67. The housing is metal, and the actuator head is made of glass-fibre-reinforced and non-combustible plastic. An adjustment indicator aids in correctly setting the rope tension. The actuator head, which can be turned in 90° increments, ensures that the Reset button—the position of which is likewise displayed by means of an indicator—is easily accessible. With deflection rollers, the course of the rope can be adjusted to many danger zones.



1 Actuator head
2 Adjustment indicator
3 Fastening for rope
4 Reset button
5 Housing cover
6 Name plate (connection data, production code and year of manufacture)

Table 3.1: ERS200 E-STOP Rope Switch

Article	Part No.	Description
ERS200-M0C3-M20-HLR	63000 500	1NC + 1NO, 3 cable entries
ERS200-M1C3-M20-HLR	63000 501	2NC, 3 cable entries

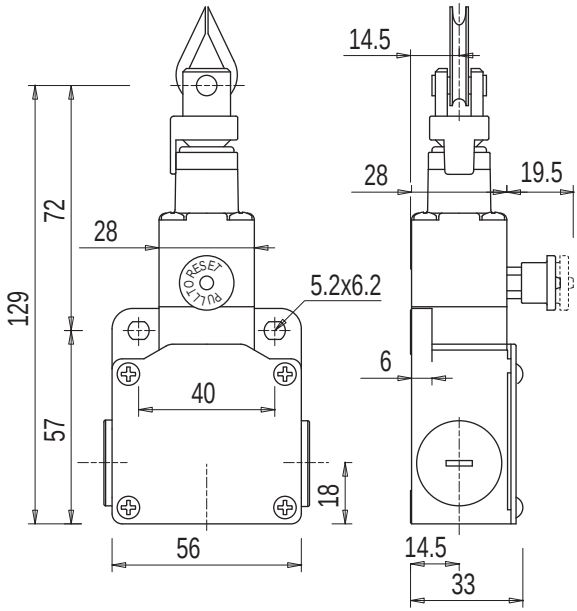


Figure 3.1: Dimensions ERS200-M0C3-M20-HLR and ERS200-M1C3-M20-HLR in mm

4 Functions

If the rope is pulled or if it breaks, an E-STOP command is triggered. The contact block remains in the Stop state until the rope tension is restored to the correct value (see adjustment indicator) and the Reset button is manually pulled out to the notch position.

5 Applications

The E-STOP Rope Switch is suitable as a device for the position-independent E-STOP command output at extended points of operation or danger zones.

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6 Mounting

WARNING

Serious accidents may result if the E-STOP Rope Switch is not mounted properly!

The protective function of the E-STOP Rope Switch is only ensured if it is appropriately and professionally mounted for the respective, intended area of application.

- Mounting may only be performed by competent personnel.
- Observe standards, regulations and environmental conditions.
- Protect the housing from penetrating soiling.
- Test to ensure proper function.

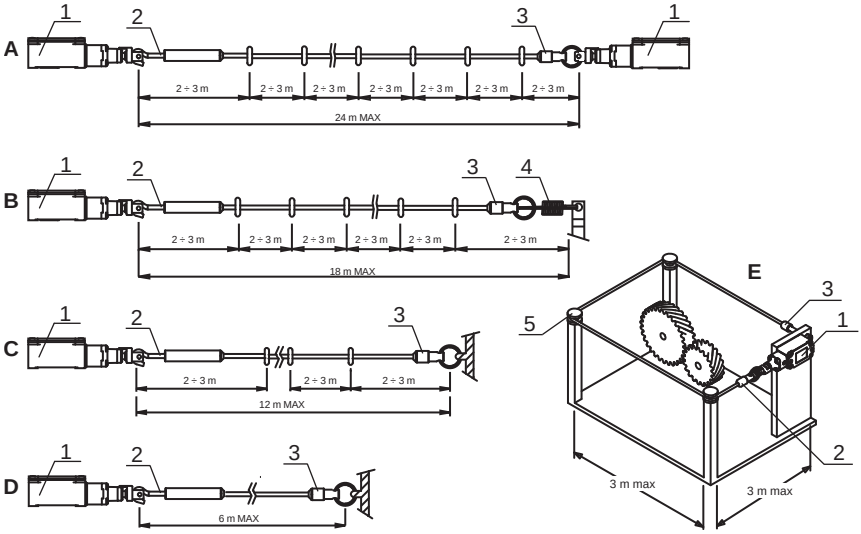

Figure 6.1: Mounting examples A–E

1 E-STOP Rope Switch (ERS200-M0C3-M20-HLR or ERS200-M1C3-M20-HLR)
2 Rope clamp with hook and lock nut, clamping sleeve
3 Rope clamp with eyelet and clamping sleeve
4 Safety spiral spring (AC-SL-ERS)
5 Deflection roller (AC-AP-ERS)

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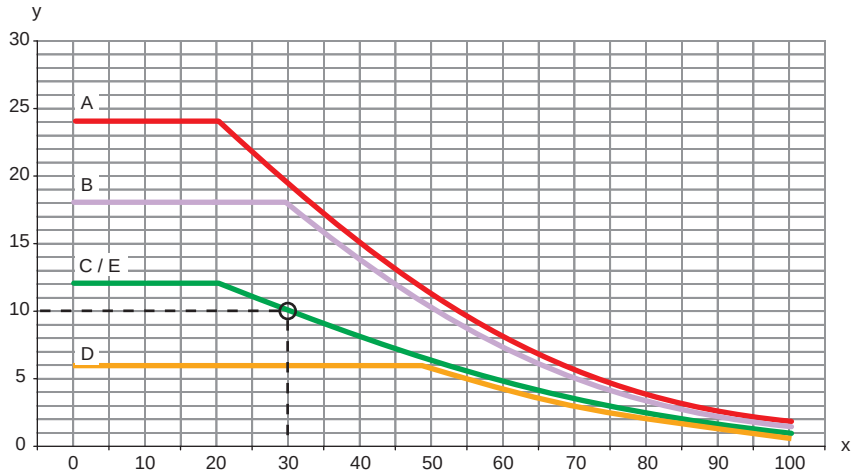

Figure 6.2: Maximum rope length as a function of temperature fluctuation for mounting examples A–E (see figure 6.1)

X-axis Temperature fluctuation in °C
Y-axis Maximum rope length in m

Example: If mounting example C is subject to temperature fluctuations of 30 °C, the maximum length of the rope is 10 m.

For applications with an elevated risk, an E-STOP Rope Switch should be mounted at each end of the rope. In this case, the changed rope length and the two-channel integration in the safety circuit must be taken into account.

6.1 Setting the actuator head

- Loosen the 4 screws on the actuator head.

- Turn the actuator head in the appropriate actuation direction for the Reset button.
- Tighten the 4 screws on the actuator head with 0.7–0.9 Nm.

6.2 Mounting the E-STOP Rope Switch

Prerequisites for mounting:

- actuator head has been set

↳ Select the mounting locations so that the following conditions are satisfied:

- maximum rope length is not exceeded (see figure 6.2)
- E-STOP Rope Switch is not subject to any physical shocks or vibrations
- rope can be easily accessed by operating personnel in the entire operating area
- pulling the rope in any direction triggers an E-STOP
- the occupied area is visible along the entire rope length from the location of the E-STOP Rope Switch
- rope is aligned with the axis of the E-STOP Rope Switch (if applicable, to the first deflection roller)

↳ Position the E-STOP Rope Switch so that it is aligned with the direction of the rope.

↳ Position the washers and screw down the E-STOP Rope Switch with 2–3 Nm.

↳ Secure stud bolt or support for rope clamp with eyelet.

↳ If necessary, mount deflection rollers.

↳ If necessary, mount eye bolts as rope guides at intervals of 2–3 m.

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6.3 Mounting the rope

WARNING

Serious accidents may result if the rope is not mounted properly!

The rope must not chafe or catch.

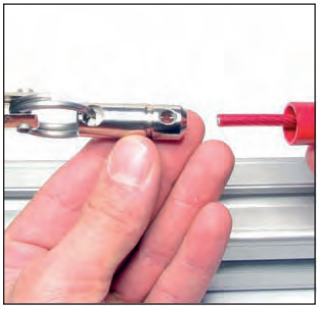
- Use deflection rollers.
- Observe the maximum lengths, which are dependent on temperature fluctuations (see chapter 6 "Mounting" and chapter 14 "Technical data").
- Pay attention to rope tension, use safety spiral springs if necessary (see chapter 13 "Accessories").

Prerequisites for proper function:

- rope and rope clamps are appropriate for the E-STOP Rope Switch
  Proper function is ensured only with original accessories (see chapter 13 "Accessories").
- E-STOP Rope Switch, rope clamps and deflection rollers are mounted
- the rope is sufficiently long (take into account deflection rollers)
- rope can be optimally positioned for ergonomics

Before the length and tension of the rope can be properly adjusted, the end of the rope opposite the E-STOP Rope Switch must first be secured.

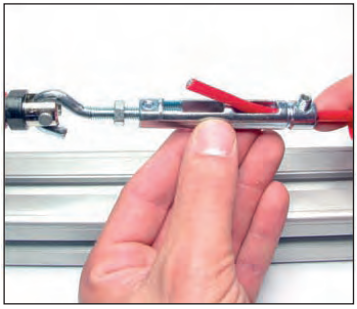
- Push the rope cover for the rope clamp onto the rope.
- Guide the rope end into the rope clamp.



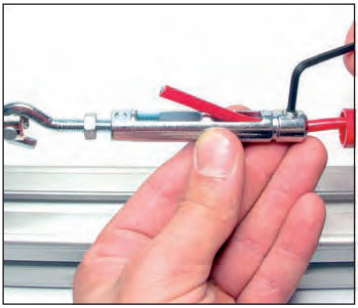
- Screw down the rope in the rope clamp.

- Push the rope cover over the rope clamp.

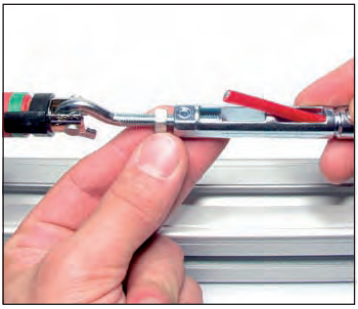
- Guide the other end of the rope (over deflection rollers and through eye bolts if applicable) up to the adjustable rope clamp with hook on the E-STOP Rope Switch.
- Push the rope cover for the rope clamp onto the rope.
- Guide the end of the rope into the rope clamp on the E-STOP Rope Switch.



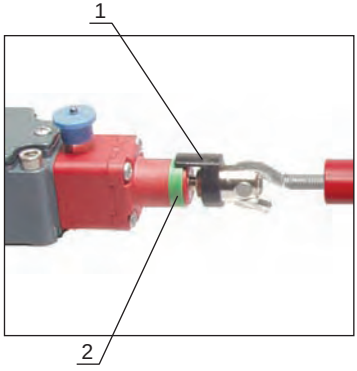
- Tighten the rope so that it does not sag and screw down in the rope clamp.



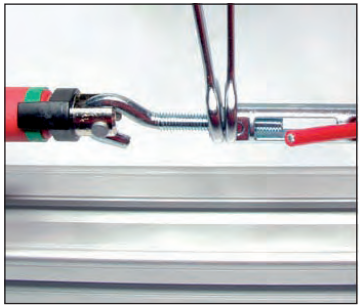
- Turn the hook to pretighten the rope.



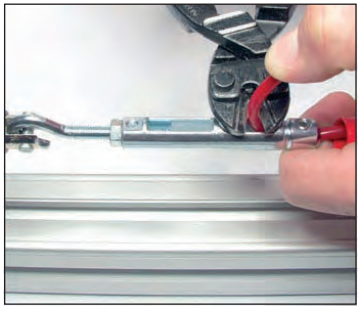
- Tighten the rope so that the adjustment indicator (1) is in the centre of the green ring (2).



↳ Secure the hook and rope clamp with a lock nut.

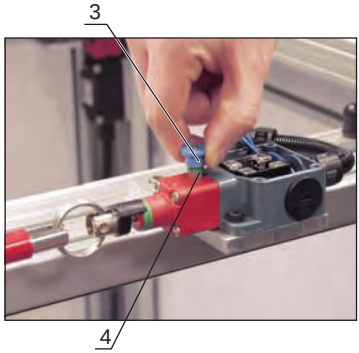


↳ If necessary, trim any excess rope.

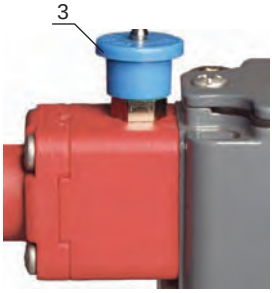


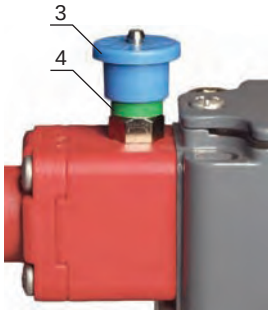
↳ Push the rope cover over the adjustable rope clamp with hook.

- Pull out the Reset button (3), thereby closing the safety contacts in the E-STOP Rope Switch.



If the rope is correctly tensioned, the Reset button (3) locks into place and a green ring (4) remains visible.





7 Electrical connection

WARNING

Serious accidents may result if the electrical connection is faulty!

↳ Electrical connection may only be performed by competent personnel.

7.1 Connecting the contact block

Prerequisites:

- temperature stability of the cable insulation material must be greater than the maximum temperature of the housing (see chapter 14 "Technical data")
- cable gland with appropriate protection rating
- maximum current load is observed (see chapter 14 "Technical data")

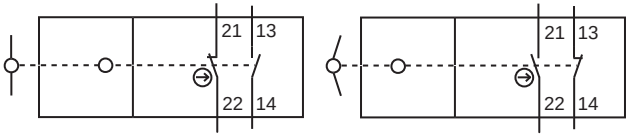


Figure 7.1: Contact block 1NC + 1NO (ERS200-M0C3-M20-HLR)

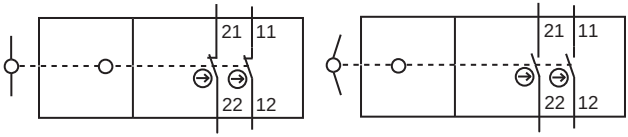


Figure 7.2: Contact block 2NC (ERS200-M1C3-M20-HLR)

DANGER

Risk of death by electric shock!

↳ Interrupt the voltage supply to the E-STOP Rope Switch.

↳ Unscrew the housing cover.

↳ Connect the contact block according to the circuit diagram.

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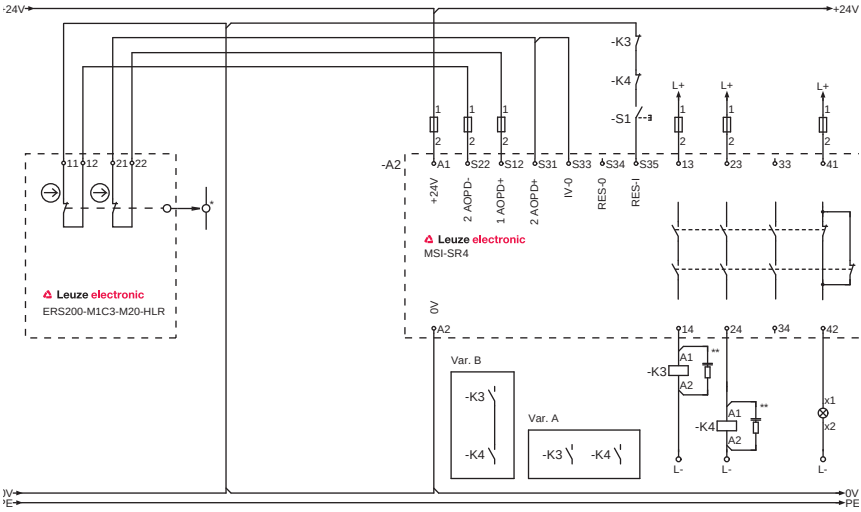
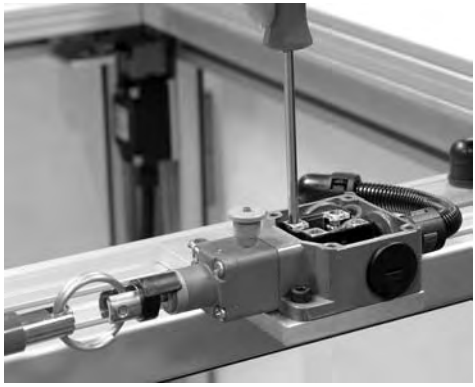
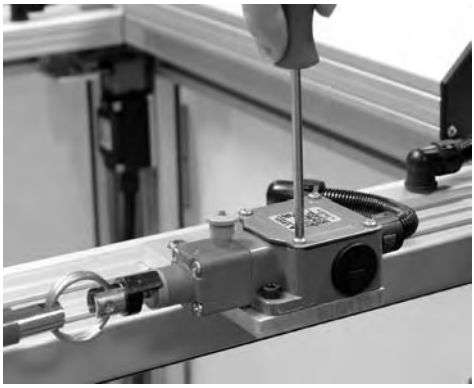


Figure 7.3: Connection example ERS200-M1C3-M20-HLR

↳ Tighten cable terminal screws with 0.6–0.8 Nm.



↳ Tighten the housing cover with 0.8–1.2 Nm.



8 Setting the device into service

Prerequisites:

- E-STOP Rope Switch is mounted and connected according to these instructions
- operating personnel have been trained in the correct use

↳ Test the function of the E-STOP Rope Switch (see chapter 9 "Testing").

The E-STOP Rope Switch is then ready for use.

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9 Testing

ERS200 E-STOP Rope Switches are maintenance-free. Nevertheless, they must be replaced after maximum 1,000,000 switching cycles; accessory parts that are subject to wear must also be replaced (e.g. safety spiral springs).

- For the testing intervals, observe nationally applicable regulations.
- Document all tests in a comprehensible manner.

9.1 To be performed prior to the initial start-up by competent personnel

- Check whether the E-STOP Rope Switch is operated in accordance with its specified environmental conditions (see chapter 14 "Technical data").
- Test to ensure proper mechanical and electrical function (see chapter 9.2).

9.2 To be performed periodically by competent personnel

Mechanical function

- Switch off the machine.
- Check that all components are securely fastened.
- Test the cable entry for leaks.
- Check for damage, deposits and wear.
- Make certain that the rope does not chafe or catch (if applicable, check deflection rollers for ease of motion).
- Make certain that the rope is not covered (obstructed, blocked etc.) and is easily accessible along the entire length.
- Check whether the rope is correctly tensioned (green ring on the adjustment indicator).
- Test the switching function.

Electrical function

⚠ WARNING

Severe accidents may result if tests are not performed properly!

- Make certain that there are no persons in the danger zone.

- Pull out the Reset button.
- Start the machine.

- Pull the rope several times in all directions and at multiple points along the entire length of the rope. Make certain that the E-STOP is triggered each time.
- Switch off the machine.
- Actuate the E-STOP Rope Switch.
- Make certain that the machine cannot be switched back on unless the Reset button is pulled out.
- Check whether the stopping time of the machine is sufficiently short (according to risk analysis and valid standards).

9.3 To be performed daily by the operating personnel

WARNING

Severe accidents may result if tests are not performed properly!

- Make certain that there are no persons in the danger zone.

- Check for damage or tampering.
- Test whether the machine stops when the rope is pulled.

10 Cleaning

There must be no soiling (e.g. shavings and dust) present, especially at the actuator head and the Reset button of the E-STOP Rope Switch.

Prerequisites for cleaning:

- machine is switched off
- voltage supply to the E-STOP Rope Switch is interrupted

- Clean the E-STOP Rope Switch regularly (e.g. with a vacuum cleaner).

11 Disposing

- The nationally valid regulations for electro-mechanical components are to be observed when disposing.

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12 Service and support

Contact data:

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Phone: +49 8141 5350-111

13 Accessories

Table 13.1: Accessories for the ERS200 E-STOP Rope Switch

Article	Part No.	Description
AC-KT10-ERS	63000 790	Accessory set; 10m rope and rope clamps
AC-KT20-ERS	63000 791	Accessory set; 20m rope and rope clamps
AC-SL-ERS	63000 792	Safety spiral spring (actuation direction in the longitudinal axis)
AC-AP-ERS	63000 793	Corner pulley
AC-STOP-ERS	63000 794	<STOP> label element (rope max. 5mm Ø)

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14 Technical data

Table 14.1: General

Switch type	E-STOP control device in acc. with EN 60947-5-5
Actuator	rope
Actuation directions	on longitudinal axis
Installation point	in rope axis
Actuation speed	min. 1 mm/s, max. 0.5 m/s
Actuation force (extraction)	83 N
Actuation force (slacken)	63 N
Actuation force (pull-out) with forced separation	90 N
Actuating path with forced separation	min. 8 mm
Mechanical life time in acc. with IEC 60947-5-1	1,000,000 switching cycles
Actuation frequency acc. to IEC 60947-5-1	max. 1 per 6 seconds
Life time according to EN ISO 13849-1	on request
Number of cycles before dangerous failure (B10d) according to EN 61810-2 with DC1 (ohmic load) with AC1 (ohmic load) with DC13 (inductive load) with AC15 (inductive load) low load (20% rated load)	on request
Usage category according to EN 60947-5-1	AC 15 (Ue / Ie): 250 V / 6 A 400 V / 4 A 500 V / 1 A DC 13 (Ue / Ie): 24 V / 6 A 125 V / 1.1 A 250 V / 0.4 A
Dimensions (dimensional drawings)	see chapter 3 "Device description"

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Table 14.2: Safety

Protection rating	IP 67
Contact allocation	ERS200-M0C3-M20-HLR: 1 NC + 1 NO ERS200-M1C3-M20-HLR: 2 NC
Contact material	silver alloy
Switching principle	slow-action contact
Opening of contact	positive-forced
Rated insulation voltage	500VAC, 600VDC
Conventional thermal current	max. 10A
Short-circuit protection according to IEC 60269-1	10A, 500V, type aM

Table 14.3: Housing

Housing material	metal

Table 14.4: Connection

Number of cable entries	3
Type of cable entry	M20 x 1.5
Conductor cross-section (stranded)	1 x 0.5mm^2 to 2 x 2.5mm^2

Table 14.5: Environment

Temperature range, operation	–25 ... +80°C
Rope length at 20°C temperature difference	max. 24 m
Dirt levels, external, in accordance with EN 60947-1	3

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15 EC Declaration of Conformity

Leuze electronic GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck

We hereby declare that the ERS200 E-STOP Rope Switch (see name plate for part no.) in the form in which it is marketed by us conforms with the relevant safety and health requirements of the listed EC directives [1] (including all changes) and that the listed standards [1] were used in its design and construction.

Fürstenfeldbruck, 02 June 2008

ppa. Dr. Holger Lehmitz
Director of the Safety Systems Division

ppa. Werner Lehner
Director of Product Management
Safety Systems Division